Diagrams of Basic Thermodynamic Functions of Multicomponent Systems

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Diagrams of the basic thermodynamic functions (enthalpy, entropy and Gibbs energy) with a wide range of parameters are useful for analysis of the consistency of the database with the data obtained by different methods. Databases for binary systems are commonly organized with calculations of the basic thermodynamic functions based either on the symmetric standard state (pure components) or on the asymmetric standard state (hypothetic unimolar solution). While in most databases the asymmetric standard state is used, we emphasize the advantages of the symmetric standard state. Recently, multicomponent systems are considered as promising for industry since they may better fit optimal thermodynamic parameters and widen the field of application of heat engines. Earlier on we developed a thermodynamic method for finding the compositions of multicomponent solutions with given properties. The method is based on the calculations of the values of the chemical potential of the volatile component. We applied this method to ternary solutions with considerable chemical interactions between components (for example, $LiCl$–$LiNO_3$–H_2O, $LiCl$–$CaCl_2$–H_2O) and found out that calculations of thermal (enthalpy and entropy) diagrams appeared to be less complicated because the essential part of the imperfect interaction of components was already accounted for in the corresponding properties of binary systems. Therefore, it is possible to calculate theoretically the diagrams for ternary systems with the needed range of thermodynamic parameters using diagrams for binary systems even when chemical interactions are considerable. It is possible also to provide task-oriented thermodynamic studies of ternary systems, minimizing experimental efforts in a wide range of concentration and temperature, paying attention to less investigated regions near phase transitions.